detached breading mixture may contain moisture from the product to be breaded and as it is tumbled may coagulate to form lumps. The perforations in the exit end of the drum are sized to allow the lumps and excess breading mixture not adhering to the product to be breaded to pass through the perforations and fall onto the lump removal conveyor located below the perforations. In the present embodiment of the invention, the sidewall **52** of the barrel is perforated by drilling a plurality of holes therein. It is to be understood that other embodiments may include use of woven screen or grating to form the lower end **59** of the barrel and thereby allow the lumps and excess breading mixture to pass therethrough.

As can be seen in FIGS. **1** and **4**, the containment shroud **60** is mounted to the upper portion of the breading mixture surge hopper **20** and positioned around the lower end **59** of the breading drum **50** and the lump removal conveyor **100**. The shroud **60** serves as a housing for containment of lumps and breading mixture that may pass through the perforations in the drum **50** other than at the bottom of the drum. The shroud **60** contains the lumps and breading mixture and directs the breading mire and lumps to the underlying lump removal conveyor **100** and the breading mixture surge hopper **20**.

Turning now to FIGS. **9**, **10** and **11**, therein is illustrated the lump removal conveyor **100**. An independent motor **110** drives a drive belt **112** that in turn drives a drive shaft **114**. Drive sprockets **116** located on the drive shaft **114** in turn drive an open mesh wire belt **120**. The continuous belt **120** passes over an idler shaft **118** at the distal end of the lump removal conveyor **100**. The lump removal conveyor frame **140** is adjustably mounted on a pair of support guides **130**. The support guides **130** are in turn fixably mounted to the inside of the surge hopper **20**. The motor **110** and the drive shaft **114** are supported by the proximal end of the rectangular conveyor frame **140** and the idler shaft **118** is supported on the distal end.

The openings in the wire mesh of the lump removal conveyor **100** are smaller than the perforations in the breading drum **50**. Breading mixture and lumps pass through the perforations in the breading drum **50** as the breading drum **50** rotates. The breading mixture and lumps fall onto the continuously moving lump removal conveyor belt **120** positioned below the perforated end **59** of the drum **50**. Breading mixture sifts through the openings in the wire mesh of the lump removal belt **120** and falls to the breading mixture surge hopper **20** below. The lumps too large to pass through the openings in the belt **120** are carried by the lump removal belt **120** to the catch pan **160** positioned below the proximal end of the belt **120**. The catch pan **160** is supported by mounting bracket **162** that is mounted to the frame **80**.

Referring to FIGS. **5** and **6**, therein is illustrated the breading mixture surge hopper **20**. The hopper **20** includes a rectangular, tapered, open topped trough **22**. Disposed in the base of the trough is a screw conveyor **26**, including an auger **28** and an independent drive motor **24** located at the distal end of the auger **28**. Breading mixture falls from the lump removal belt **100** above and is collected in the bottom of the trough **22**. The screw conveyor **26** moves the breading mixture to the proximal end of the trough **22** that is positioned below the breading mixture metering hopper **20**. A predetermined amount of new breading mixture is fed from the metering hopper **40** above and mixes with the recirculated breading mixture in the trough **22** of the surge hopper **20**. The volume of new breading mixture equals the volume of the breading mixture leaving as breading with the product in the take out conveyor and the breading mixture coagulated and collected in the catch pan **160**.

Referring to FIGS. **1** and **6**, the mixed new and recirculated breading mixture falls through an opening **29** in the bottom of the trough **22** into the bottom end **202** of the recirculation conveyor **200**, wherein the cycle heretofore described begins again.

As illustrated in FIGS. **1** and **3**, the breading mixture surge hopper **20**, the breading drum **50**, the containment shroud **60**, the drum cradle assembly **70**, the frame **80**, the lump removal conveyor **100**, the recirculation screw conveyor **200**, the input conveyor **400**, the takeout conveyor **300**, and associated drive motors are all supported by the apparatus frame **80** having a plurality of rollers **82** that enable the breading apparatus **10** to be moved as a self contained unit.

It is important to note that the lump removal conveyor **100**, working in cooperation with the perforated end **59** of breading drum **50**, is one of the most important features of the present invention. If lumps are not removed from the recirculated breading mixture by the lump removal conveyor **100**, the lumps will continue to grow in size in successive recirculations by coagulation with additional moist breading mixture that has become disengaged from the product to be breaded. When the lumps reach a size that will not pass thorough the perforations in the lower end **59** of the breading drum **50**, they will pass with the breaded product out the end of the breading drum onto the take out conveyor **300** and be transported to the fryer/oven, additional processing stations, or a wrapping station. It is obviously undesirable for lumps of breading to be sold to the consumer with the breaded product.

It is also important to note that the metering hopper contributes to the improved quality and consistency of the breaded product by greatly reducing wide swings in moisture content of the breading mixture, thereby allowing consistent adhesion of the breading to the product and providing an even breading coverage and thickness. In the prior art, two bags of breading mixture, approximately 100 pounds, was added at one time to the prior art breading apparatus. This prior art method of operation created 100 pound surge cycles. The breading mixture was recirculated until additional breading mixture was required. The prior art surge cycle manner of operation created breading moisture ranges from dry to sticky clumps, creating non-uniform breaded product during each 100 pound surge cycle.

Although the preferred and alternative embodiments of the invention have been illustrated in the accompanying drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiment disclosed but is capable of numerous modifications without departing from the scope of the invention as claimed.

Other alterations and modifications of the invention will likewise become apparent to those of ordinary skill in the art upon reading the present disclosure, and it is intended that the scope of the invention disclosed herein be limited only by the broadest interpretation of the appended claims to which the inventors are legally entitled.

What is claimed is:

1. In combination with a food breading apparatus of the type comprising a drum having an inlet end for receiving food and breading a discharge end for discharging breaded food and excess breading, and structure supporting the drum for rotation about a longitudinal axis, a lump removal system comprising:

a) a drive motor;

b) a conveyor screen driven by said motor for movement along a path extending beneath the discharge end of the